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ROCKY FLATS OFFICE
P O BOX 928
GOLDEN COLORADO 80402-0928

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ROCKY FLATS PLANT
CORRESPONDENCE CONTROL

Mr. Martin Hestmark
U. S. Environmental Protection Agency, Region VIII
ATTN: Rocky Flats Project Manager, 8HWM-FF
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Mr. Joe Schieffelin
Hazardous Waste Facilities Unit Leader
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Gentlemen


Enclosed for your information are the results of three studies identified in the Operable Unit No. 5 Addendum to the Field Sampling Plan, Technical Memorandum No. 15.

These studies are

- 1 Visual Survey of Women Creek (Enclosure 1)
- 2 Intrinsic Air Permeability Evaluation (Enclosure 2)
- 3 Visual Survey of Time Domain Electromagnetic Survey Anomalies
(Enclosure 3)

If you have any questions regarding these results, please contact Kurt Muenchow at 966-2184

Sincerely,


Steven W Slaten
IAG Project Coordinator
Environmental Restoration

Enclosure

cc w/o Enclosure
B Lavelle, EPA
F Lockhart, ER RFFO
K Muenchow, ER, RFFO
C Bicher, EG&G

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Results of Visual Survey of Woman Creek

On October 14, 1994, a visual survey of Woman Creek was performed per Technical Memorandum No 15 (TM15), Addendum to the Field Sampling Plan (§ 3 2 2 2), in order to assess the presence of outcropping bedrock. This survey was conducted over an area beginning at the western-most access road of OU5 and ending east of the IHSS 133 area, downslope of the western end of IHSS 115. A previous visual survey was performed at 11 specific locations along Woman Creek to obtain similar information for groundwater modeling activities. This survey extended from just west of the western-most access road to OU5 and ended at a point just below Pond C-2. The results of both surveys showed no indication of outcropping bedrock. The creek bottom and the drainage sidewalls at all locations were observed to be covered with alluvial material.

Results of the Intrinsic Air Permeability Evaluation

As discussed in Technical Memorandum No 15 (TM15), Addendum to the Field Sampling Plan (§ 3 1 2 1), the intrinsic air permeability test indicated that short-circuiting may have occurred during the performance of the soil-gas survey at IHSS 115. Further evaluation of the data collected during the intrinsic air permeability tests indicate that short-circuiting likely did not occur during the soil-gas survey (See attached evaluation methodology). Since the results of the soil-gas survey appear to be valid, no additional sampling will be performed in IHSS 115.



OU5 - INTRINSIC AIR PERMEABILITY EVALUATION

Overview

As discussed in Technical Memorandum 15, a soil gas survey was performed at IHSS 115 (the Original Landfill) to identify areas of volatile organic contamination. Subsequently, a small-scale study of vacuum vs. time and distance was performed to estimate the intrinsic air-permeability at IHSS 115. The data collected during the permeability study were used to estimate intrinsic air permeability by the method presented in "A Practical Approach to the Design, Operation, and Monitoring of In Situ Soil Venting Systems," (Johnson, P.C., Stanley, C.C., Kemblowski, M.W., Byers, D.L., and Colthart, J.D., GWMR, Spring, 1990). A copy of the relevant pages of this paper is attached.

The spreadsheet pages in Appendix D of TM 15 present the equations used. In summary, the gauge vacuum reading is plotted vs. the \log_{10} of time. The slope of the line is computed by linear regression and is then used in the equation to calculate the intrinsic air permeability, k .

The data from the study resulted in computed k values that were orders of magnitude greater than those expected for clayey soils. Two explanations for this discrepancy are that the soils at the test sites are not clayey or that short circuiting of the vapor flow path occurred during the test. Because the test was conducted in the same manner as the soil gas survey, short circuiting during the survey was considered to be a possibility. Consequently, further evaluation of the soil gas survey data was deemed necessary.

Because the data collected during the soil gas survey included vacuum gauge readings at various intervals of the 5-minute purging session, it was proposed in TM 15 that the recorded survey vacuum pressures be reviewed, along with the boring logs for nearby locations. At those locations at which vacuum readings were not significantly above background and the soil type is known to be of low permeability, it would be assumed that short circuiting had occurred. Additional soil gas sampling would be proposed for those areas at which short-circuiting occurred and at which soil or groundwater was not analyzed.

Discussion

Although most of the soil gas samples were collected by the hydraulic-probing and purging system, several soil gas survey locations were purged with a manual pump. This manual apparatus was not equipped to monitor vacuum levels. However, manual purging took more time than the hydraulic system. Therefore, the gradient of vacuum vs. time was less likely to induce short circuiting.

PROJECT OU5 RF/RI SUBJECT Evaluation of Short Circuiting SHEET 1 of 2
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OU5 - INTRINSIC AIR PERMEABILITY EVALUATION

Discussion, continued

The OU5 database was queried for all borehole and groundwater volatile organic (VOC) analyses for IHSS 115. The result was a list of all such boreholes, their Rocky Flats Coordinates, sample numbers, and lab results. Boring logs were compiled, and depth intervals and lithological descriptions were added to the attached spreadsheet (Excel 5.0, "PERMEVAL.XLS").

The soil gas survey data spreadsheet was sorted by coordinates. For each boring, nearby soil gas survey sample locations were determined and the corresponding information copied to the spreadsheet. For each boring for which a log was found, the soil gas survey vacuum vs. time data were analyzed as described above. The result was a calculated intrinsic air permeability, k . The Johnson article referenced above contained a figure that presented a range of k values for each soil type (Figure 5 in the attached article). The calculated k values and the corresponding soil types were compared to the soil types indicated in the boring logs (at corresponding depths). In each case, the calculated k values either concurred with the boring logs or indicated a less-permeable soil type. Therefore, it may be concluded that short-circuiting did not occur at locations near borings.

For soil gas sample locations that are not near borings, there is no known lithologic data to which calculated k values may be compared. However, the vacuum readings for the entire soil gas survey were reviewed to evaluate occurrences that did not exceed background. Background vacuum (for the probe and tubing system in ambient air) was recorded at 3.5 inches Hg (mercury) during the intrinsic air-permeability study. The soil gas survey data revealed the lowest 5-minute vacuum reading to be 4.1 inches Hg. This value is 17 percent greater than background.

Conclusion

Because background vacuum levels were significantly exceeded at all locations of the soil gas survey at which the hydraulic system was used, calculation-derived soil types generally concur with those described in boring logs, and manual purging is unlikely to induce short circuiting, it is concluded that short circuiting did not occur during the soil gas survey at IHSS 115.

PROJECT OU5 RFI/RI SUBJECT Evaluation of Short Circuiting SHEET 2 of 2
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Results of Visual Survey of Time Domain Electromagnetic (TDEM) Survey Anomalies

On September 8, 1994, a visual survey of anomalies identified by the TDEM Survey of the 133 IHSS group was performed per Technical Memorandum No 15 (TM15), Addendum to the Field Sampling Plan (§ 3 2 2 1). The purpose of this survey was to identify those areas where surface metallic debris was the source of the TDEM anomaly. This survey was conducted by establishing the TDEM survey baseline, and then searching a 50 foot radius around each TDEM anomaly. Surficial metallic objects discovered near an anomaly were noted in the field log books, indicating anomaly coordinates and brief descriptions of the surface metallic object(s).

In all but two instances, the cause of the anomaly was traced directly to surface metallic objects or to previously identified anomalies. The two exceptions are as follows (see attached figure and also reference figure 2 5 2 2-3 in TM15)

- Coordinates 540E, 180S Described in the field log book as a small, oblong mound, approximately 8 feet (east-west) by 5 feet (north-south) and 0.5 feet higher than the surrounding terrain with no identifiable surface metal
- Coordinates 2390E, 410S Described in the field log book as a circular disturbance roughly 4 feet in diameter with no visible surface metal in the surrounding area. There is no evidence of mounding or other indications of an excavation in this area.

Because of the shape and nature (i.e., mounded soil) of the first anomaly, it was recommended this anomaly be further investigated by drilling one borehole in the center of the anomaly as shown in Attachment #2. Since this location was outside the boundary of an identified IHSS and did not have the typical size of the ash pits previously identified, the core from this borehole would only be submitted for laboratory analysis if field monitoring of core samples indicated above-background readings. This anomaly was sampled with the Kansas sampler per protocol detailed in TM15 and no waste material was encountered.

Analysis of the geometry and size of the second anomaly suggests that drilling is not warranted. Since no evidence is present to suggest previous mounding or excavation at this anomaly site, it was recommended to survey this area with a metal detector and a FIDLER for radiological contamination. Since these surveys did not exhibit any signs of contamination, no borings of the anomaly were conducted.

